

Enabling Rate Limits using Envoy

 6 minute read  page test

This task shows you how to use Envoy's native rate limiting to dynamically limit the traffic to an Istio service. In this task, you will apply a global rate-limit for the `productpage` service through ingress gateway that allows 1 requests per minute across all instances

of the service. Additionally, you will apply a local rate-limit for each individual `productpage` instance that will allow 10 requests per minute. In this way, you will ensure that the `productpage` service handles a maximum of 1 request per minute through the ingress gateway, but each `productpage` instance can handle up to 10 requests per minute, allowing for any in-mesh traffic.

Before you begin

1. Setup Istio in a Kubernetes cluster by following the instructions in the `Installation Guide`.
2. Deploy the `Bookinfo` sample application.

Rate limits

Envoy supports two kinds of rate limiting: global and local. Global rate limiting uses a global gRPC rate limiting service to provide rate limiting for the entire mesh. Local rate limiting is used to limit the rate of requests per service instance. Local rate limiting can

be used in conjunction with global rate limiting to reduce load on the global rate limiting service.

In this task you will configure Envoy to rate limit traffic to a specific path of a service using both global and local rate limits.

Global rate limit

Envoy can be used to set up global rate limits for your mesh. Global rate limiting in Envoy uses a gRPC API for requesting quota from a rate limiting service. A

reference implementation of the API, written in Go with a Redis backend, is used below.

1. Use the following configmap to configure the reference implementation to rate limit requests to the path `/productpage` at 1 req/min and all other requests at 100 req/min.

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ratelimit-config
data:
  config.yaml: |
    domain: productpage-ratelimit
    descriptors:
      - key: PATH
        value: "/productpage"
        rate_limit:
          unit: minute
          requests_per_unit: 1
      - key: PATH
        rate_limit:
          unit: minute
          requests_per_unit: 100
```

2. Create a global rate limit service which

implements Envoy's rate limit service protocol. As a reference, a demo configuration can be found [here](#), which is based on a reference implementation provided by Envoy.

3. Apply an `EnvoyFilter` to the `ingressgateway` to enable global rate limiting using Envoy's global rate limit filter.

The first patch inserts the `envoy.filters.http.ratelimit` global envoy filter **filter** into the `HTTP_FILTER` chain. The `rate_limit_service` field specifies the external rate limit service, `rate_limit_cluster` in this case.

The second patch defines the `rate_limit_cluster`,

which provides the endpoint location of the external rate limit service.

```
$ kubectl apply -f - <<EOF
apiVersion: networking.istio.io/v1alpha3
kind: EnvoyFilter
metadata:
  name: filter-ratelimit
  namespace: istio-system
spec:
  workloadSelector:
    # select by label in the same namespace
    labels:
      istio: ingressgateway
  configPatches:
    # The Envoy config you want to modify
    - applyTo: HTTP_FILTER
      match:
        context: GATEWAY
```



```
    listener:
      filterChain:
        filter:
          name: "envoy.filters.network.http_connection_
manager"

          subFilter:
            name: "envoy.filters.http.router"
      patch:
        operation: INSERT_BEFORE
        # Adds the Envoy Rate Limit Filter in HTTP filter c
hain.
        value:
          name: envoy.filters.http.ratelimit
          typed_config:
            "@type": type.googleapis.com/envoy.extensions.f
ilters.http.ratelimit.v3.RateLimit
            # domain can be anything! Match it to the ratel
imiter service config
            domain: productpage-ratelimit
            failure_mode_deny: true
```

```
        timeout: 10s
        rate_limit_service:
          grpc_service:
            envoy_grpc:
              cluster_name: rate_limit_cluster
          transport_api_version: V3
- applyTo: CLUSTER
  match:
    cluster:
      service: ratelimit.default.svc.cluster.local
  patch:
    operation: ADD
    # Adds the rate limit service cluster for rate limit
    t service defined in step 1.
    value:
      name: rate_limit_cluster
      type: STRICT_DNS
      connect_timeout: 10s
      lb_policy: ROUND_ROBIN
      http2_protocol_options: {}
```

```

load_assignment:
  cluster_name: rate_limit_cluster
  endpoints:
    - lb_endpoints:
        - endpoint:
            address:
              socket_address:
                address: ratelimit.default.svc.cluste
r.local
                port_value: 8081
EOF

```

4. Apply another `EnvoyFilter` to the `ingressgateway` that defines the route configuration on which to rate limit. This adds rate limit actions for any route from a virtual host named `*.80`.

```
$ kubectl apply -f - <<EOF
```

```
apiVersion: networking.istio.io/v1alpha3
kind: EnvoyFilter
metadata:
  name: filter-ratelimit-svc
  namespace: istio-system
spec:
  workloadSelector:
    labels:
      istio: ingressgateway
  configPatches:
    - applyTo: VIRTUAL_HOST
      match:
        context: GATEWAY
        routeConfiguration:
          vhost:
            name: ""
            route:
              action: ANY
      patch:
        operation: MERGE
```

```
# Applies the rate limit rules.  
value:  
  rate_limits:  
    - actions: # any actions in here  
      - request_headers:  
          header_name: ":path"  
          descriptor_key: "PATH"
```

EOF

Local rate limit

Envoy supports local rate limiting of L4 connections and HTTP requests. This allows you to apply rate limits at the instance level, in the proxy itself, without calling

any other service.

The following `EnvoyFilter` enables local rate limiting for any traffic through the `productpage` service. The `HTTP_FILTER` patch inserts the `envoy.filters.http.local_ratelimit` local envoy filter into the HTTP connection manager filter chain. The local rate limit filter's `token bucket` is configured to allow 10 requests/min. The filter is also configured to add an `x-local-rate-limit` response header to requests that are blocked.

```
$ kubectl apply -f - <<EOF
apiVersion: networking.istio.io/v1alpha3
```

```
kind: EnvoyFilter
metadata:
  name: filter-local-ratelimit-svc
  namespace: istio-system
spec:
  workloadSelector:
    labels:
      app: productpage
  configPatches:
    - applyTo: HTTP_FILTER
      match:
        context: SIDECAR_INBOUND
        listener:
          filterChain:
            filter:
              name: "envoy.filters.network.http_connection_manag
er"
      patch:
        operation: INSERT_BEFORE
        value:
```

name: envoy.filters.http.local_ratelimit

typed_config:

"@type": type.googleapis.com/udpa.type.v1.TypedStruct

type_url: type.googleapis.com/envoy.extensions.filters

rs.http.local_ratelimit.v3.LocalRateLimit

value:

stat_prefix: http_local_rate_limiter

token_bucket:

max_tokens: 10

tokens_per_fill: 10

fill_interval: 60s

filter_enabled:

runtime_key: local_rate_limit_enabled

default_value:

numerator: 100

denominator: HUNDRED

filter_enforced:

runtime_key: local_rate_limit_enforced

default_value:


```
      numerator: 100
      denominator: HUNDRED
    response_headers_to_add:
      - append: false
        header:
          key: x-local-rate-limit
          value: 'true'
```

EOF

The above configuration applies local rate limiting to all vhosts/routes. Alternatively, you can restrict it to a specific route.

The following `EnvoyFilter` enables local rate limiting for any traffic to port 80 of the `productpage` service. Unlike the previous configuration, there is no

token_bucket included in the HTTP_FILTER patch. The token_bucket is instead defined in the second (HTTP_ROUTE) patch which includes a typed_per_filter_config for the envoy.filters.http.local_ratelimit local envoy filter, for routes to virtual host inbound|http|9080.

```
$ kubectl apply -f - <<EOF
apiVersion: networking.istio.io/v1alpha3
kind: EnvoyFilter
metadata:
  name: filter-local-ratelimit-svc
  namespace: istio-system
spec:
  workloadSelector:
    labels:
      app: productpage
```

```
configPatches:
  - applyTo: HTTP_FILTER
    match:
      context: SIDECAR_INBOUND
      listener:
        filterChain:
          filter:
            name: "envoy.filters.network.http_connection_manag
er"
        patch:
          operation: INSERT_BEFORE
          value:
            name: envoy.filters.http.local_ratelimit
            typed_config:
              "@type": type.googleapis.com/udpa.type.v1.TypedStruc
t
              type_url: type.googleapis.com/envoy.extensions.filte
rs.http.local_ratelimit.v3.LocalRateLimit
            value:
              stat_prefix: http_local_rate_limiter
```

```
- applyTo: HTTP_ROUTE
  match:
    context: SIDECAR_INBOUND
    routeConfiguration:
      vhost:
        name: "inbound|http|9080"
        route:
          action: ANY
  patch:
    operation: MERGE
    value:
      typed_per_filter_config:
        envoy.filters.http.local_ratelimit:
          "@type": type.googleapis.com/udpa.type.v1.TypedStr
uct
          type_url: type.googleapis.com/envoy.extensions.filters.http.local_ratelimit.v3.LocalRateLimit
          value:
            stat_prefix: http_local_rate_limiter
            token_bucket:
```

```
    max_tokens: 10
    tokens_per_fill: 10
    fill_interval: 60s
filter_enabled:
  runtime_key: local_rate_limit_enabled
  default_value:
    numerator: 100
    denominator: HUNDRED
filter_enforced:
  runtime_key: local_rate_limit_enforced
  default_value:
    numerator: 100
    denominator: HUNDRED
response_headers_to_add:
  - append: false
    header:
      key: x-local-rate-limit
      value: 'true'
```

EOF

Verify the results

Verify global rate limit

Send traffic to the Bookinfo sample. Visit `http://$GATEWAY_URL/productpage` in your web browser or issue the following command:

```
$ curl "http://$GATEWAY_URL/productpage"
```

`$GATEWAY_URL` is the value set in the Bookinfo

example.

You will see the first request go through but every following request within a minute will get a 429 response.

Verify local rate limit

Although the global rate limit at the ingress gateway limits requests to the `productpage` service at 1 req/min, the local rate limit for `productpage` instances allows 10

req/min. To confirm this, send internal `productpage` requests, from the `ratings` pod, using the following `curl` command:

```
$ kubectl exec "$(kubectl get pod -l app=ratings -o jsonpath='{.items[0].metadata.name}')" -c ratings -- curl -sS productpage:9080/productpage | grep -o "<title>.*</title>"  
<title>Simple Bookstore App</title>
```

You should see no more than 10 req/min go through per `productpage` instance.